THE MEAN SUMMER ATMOSPHERE OF THE RAINY SEASON OVER THE WESTERN

TROPICAL PACIFIC OCEAN[1]

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One of the main uses of standard atmospheres is that the synoptic sequence of events can be represented in terms of deviations from the standard. In addition, it furnishes mean climatic information. Neither the International Commission for Air Navigation nor the U. S. Standard Atmospheres are satisfactory for either of these purposes in the tropics. Mean conditions in low latitudes differ sufficiently from those of extratropical regions to warrant computation of a tropical standard atmosphere.

This was first done by Schacht [1] for the Caribbean area with soundings from Swan Island (17.4°N; 83.9°W); San Juan, Puerto Rico (18.5°N, 66.1°W), and Miami, Florida. He computed mean soundings for both daytime and nighttime. However, for purposes of defining standard atmospheres only the nighttime results should be considered since the daytime soundings have been found to be less reliable.

Subsequent to Schacht, the United States Weather Bureau [2] defined another standard atmosphere which, however, has remained unofficial. It is based on data from the same stations used by Schacht and a fourth station, Brownsville, Texas. This mean sounding differs from that presented by Schacht.

Recently, the writer has had occasion to require a tropical standard atmosphere for the western Pacific Ocean. For this purpose, data were available from several stations for the period 1944-1947. Of these, the nighttime observations (1500Z) from June to September at Kwajalein (8.9°N, 167.8°E), Guam (13.5°N, 144.8°E), and Palau (7.5°N, 134.4°E) were chosen as a representative sample.

Table I presents data for the Pacific mean sounding and a comparison with Schacht's sounding, along with the deviations of the three stations used from the mean. These deviations are quite small so that the combination is entirely permissible. The differences between the Caribbean and the western Pacific, also, are very small- perhaps smaller than might be expected. Over the western Pacific, the mean atmosphere is a little warmer in the low levels, a little cooler at high levels, and a little moister at all levels than in the Caribbean. Both soundings are reproduced on a tephigram in fig. 1. It is evident that definition of an official standard atmosphere for the western part of the tropical oceans in the rainy season is entirely feasible. Either of the soundings shown in fig. 1 or their mean can be used.

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REFERENCES

[1] Schacht, E. J., 1946: A Mean Hurricane Sounding for the Caribbean Area, Bull. Amer. Meteor. Soc., 27, pp. 324-327

[2] U. S. Weather Bureau, 1948: Hurricane Notes, Training Paper No. 1, 210 pp.

TABLE I

Mean Tropical Summer Atmosphere at Night for the Southwest Pacific Region

| | Pacific Mean Sounding | | | Deviations from Caribbean Sounding | | | Deviations from the Pacific mean | | | | | | | | |
| | | | | | | | Kwajalein | | | Guam | | | Palau | | |
Level (mb)	Ht. (tens of ft)	T (°C)	RH (%)	ΔHt. (tens of ft)	ΔT (°C)	ΔRH (%)	ΔHt. (tens of ft)	ΔT (°C)	ΔRH (%)	ΔHt. (tens of ft)	ΔT (°C)	ΔRH (%)	ΔHt. (tens of ft)	ΔT (°C)	ΔRH (%)
1010.0	0	26.6	85	(−3.6)	+1.3	0	(−2.6)	+0.5	−5	(+1.1)	−0.7	+6	(−0.4)	+0.2	−1
1000	32	25.9	82	−7	+1.3	0	−3	+0.4	−3	0	−0.4	+4	−2	0.0	−1
950	278	22.9	88	−11	+0.5		−2	+0.3	−1	+2	0.2	+2	0	−0.4	0
900	332	19.0	84	−9	+0.1	+1	−1	+0.4	−2	+2	0.3	+2	0	−0.7	0
850	494	17.0	80	−8	+0.1		−1	+0.3	−3	+2	0.2	+2	−1	−0.5	+1
800	663	14.5	76	−8	+0.2	+2	−1	+0.4	−3	+2	0.1	+1	−1	−0.8	+2
750	842	11.7	72	−8	+0.5		−1	+0.5	−4	+3	0.1	0	−1	−0.6	+5
700	1030	8.6	67	−1	+0.1	+7	−1	+0.5	−6	+2	0.1	−2	−3	−0.7	+7
650	1232	5.0	64	−8	−0.1		+2	+0.6	−6	+2	0.1	−2	−5	−0.6	+8
600	1448	1.2	64	−7	−0.3	+12	+3	+0.6	−6	+2	0.0	−2	−5	−0.5	+5
550	1676	−2.7	65	−5	−0.4		+5	+0.6	−6	0	−0.2	−3	−6	−0.3	
500	1818	−7.0	62	−8	−0.3	+15	+6	+0.5	−6	+1	−0.4	−3	−8	−0.2	
450	2189	−12.0	79	+3	−0.1		+7	+0.5	−4	−1	−0.5	−4	−6	0.0	
400	2482	−17.7	56	−6	−0.4		+7	+0.4	−5	−1	−0.5	−1	−7	+0.2	
350	2804	−24.0	56	−6	−0.1		+7	+0.3	−7	−1	−0.6	+2	−7	+0.2	
300	3165	−35.2	53	−8	−0.6		+3	+0.4	−5	+1	−0.6	+1	−4	+0.3	
250	3574	−43.7		−11	−1.0		+4	+0.6		0	−0.7		−3	+0.2	
200	4053	−55.8		−14	−1.0		+7	+1.0		−1	−0.9		−4	−0.1	
175	4320	−62.3		−16	−1.1		+6	+0.8		−2	−0.8		−3	−0.1	
150	4639	−68.9		−13	−0.9		+4	+0.9		−2	−0.4		−3	−0.6	
125	4988	−74.1		−7	−0.1		−1	+0.7		+1	−0.7		0	0.0	
100	5422	−76.5		−6	+0.6		0	+0.8					+1	−0.8	
80	5844	−74.2		−8	−1.0		+1	+0.5					−1	−0.6	